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**GB 2179002 A GB 1370204 A JP 510039784 A  
JP 490014342 B JP 030087252 A US 5139700 A**

(58) Field of Search

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ONLINE:WPI,CLAIMS**

(54) **Composite packing sheets**

(57) A composite sheet for use in mailing packings, in particular as a protection from water vapour permeation, comprises

- an outer layer made of poly(alkylene terephthalate), polyalkylene or polyamide sheets, woven or non-woven fabrics, natural fibre or synthetic woven or non-woven fabrics, or paper;
- optionally a low-pore aluminium foil; and
- a heat sealable coating bonded to the previous layer which faces the packaged goods;

characterized in that said heat sealable coating contains corrosion inhibiting additives for ferrous metals and/or non-ferrous metals.

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Composite Sheets

The object of the present invention is a composite sheet for the use in mailing packings, in particular as a protection from water vapour permeation.

5 The prior art employs aluminium composite sheets in different combinations, in particular, for corrosion prevention and export packaging. Usually, poly(alkylene terephthalate), polyalkylene or polyamide sheets, woven or non-woven fabrics, natural fibre  
10 woven or non-woven fabrics as well as paper serve as the outer layer.

The composite sheets are used as a so-called barrier layer in the form of bags or case insets against diffusion of ambient moisture.

15 The goods thus packaged must be additionally protected from corrosion, for example, inside the packing, by means of desiccants or other materials containing corrosion inhibiting additives (often designated as VCI agents, VCI meaning "volatile corrosion inhibitor"). Those active substances may be incorporated in various substrate materials, for instance, paper, foams or  
20 plastic sheets.

However, the additional use of such substrate materials has proven disadvantageous with respect to expenditures for materials. Moreover, the addition of the substrate materials involves an additional manufacturing operation.

It has now been found, according to the invention, that a combination of composite sheet with a heat sealable coating containing corrosion inhibiting additives for ferrous metals and/or non-ferrous metals instead of the known polyethylene sheet avoids the necessity for an additional corrosion inhibition inside the packing by means of desiccants and/or other corrosion inhibiting additives.

This not only saves operating time but also additional packaging material, and relieves the environment.

The composite sheet according to the invention can be employed as a barrier layer without problems and processed into flat sheets, bags or case insets like known composite sheets.

In one manufacturing operation, potential corrosion inhibition is achieved for years.

Thus, a first embodiment of the present invention consists in a composite sheet for the use in mailing packings, in particular as a protection from water vapour permeation, comprising

- an outer layer made of poly(alkylene terephthalate), poly-alkylene or polyamide sheets, woven or non-woven fabrics, natural fibre or synthetic woven or non-woven fabrics, or paper;
- a low-pore aluminium foil; and
- a heat sealable coating bonded thereto which faces the packaged goods;

characterized in that said heat sealable coating contains corrosion inhibiting additives for ferrous metals and/or non-ferrous metals.

An alternative embodiment of the present invention consists in a composite sheet for the use in mailing packings, in particular as a protection from water vapour permeation, comprising

- an outer layer made of poly(alkylene terephthalate), poly-alkylene or polyamide sheets, woven or non-woven fabrics, natural fibre or synthetic woven or non-woven fabrics, or paper; and
- a heat sealable coating bonded thereto which faces the packaged goods;

characterized in that said heat sealable coating contains corrosion inhibiting additives for ferrous metals and/or non-ferrous metals.

By using the present invention, it is possible to provide composite sheets for the use in mailing packings, in particular as a protection from water vapour permeation, which avoid the necessity for additional desiccants and/or substrate materials containing corrosion inhibiting additives for ferrous metals and/or non-ferrous metals.

Particularly preferred poly(alkylene terephthalates) in accordance with the present invention are polyethylene and/or poly(butylene terephthalates). Particularly preferred polyalkylene sheets, woven or non-woven fabrics include those made of polyethylene and/or polypropylene. Similarly, natural fibres, for instance, cotton fibre woven fabrics, may preferably be used as the outer layer. Optionally, paper may be used in the same way as the outer layer.

The thickness of the aluminium foil is determined, in particular, by the water vapour permeability desired. Thus, it is possible to use the composite sheet as a purely mechanical reinforcement without a barrier layer against water vapour such that an outer layer as defined above is laminated immediately with the heat

sealable coating. To ensure a sufficient water vapor barrier effect, it is preferred in accordance with the present invention to use the aluminium foil in a thickness of at least 7  $\mu\text{m}$ , in particular, 12  $\mu\text{m}$  or more.

- 5 To ensure sufficient heat sealability, the heat sealable coating too should have a minimum thickness. Thus, it is preferred in accordance with the present invention to use a thickness of the heat sealable coating of at least 50  $\mu\text{m}$ , in particular, 75  $\mu\text{m}$  or more.
- 10 Preferably, said heat sealable coating is made of a polyethylene, especially LLDPE, LDPE, HDPE, a polypropylene, or mixtures or copolymers of the materials mentioned.

The corrosion inhibiting additives for ferrous metals and/or non-ferrous metals can be incorporated in the heat sealable coatings  
15 by per se known methods.

It is particularly preferred in accordance with the present invention to select the corrosion inhibiting additives from amines, aminoimidazolines, aminophenols, nitrophenols, aminotriazoles, aldehydes, benzotriazole, dibenzylsulfoxide, dithiophosphonic  
20 acids, guanidine derivatives, ureas, phosphonium salts, sulfonium salts, sulfonic acids, thioethers, thioureas, and thiocarbamoyl disulfides. Such materials are per se known in the prior art, however, they are employed herein for the first time directly in connection with a composite sheet for the use in mailing  
25 packings, in particular as a protection from water vapour permeation, without being bound to separate substrate materials which are commonly used in the packaging containers of the prior art.

The bonding of the outer layer to the optionally present  
30 aluminium foil and the heat sealable coating bonded thereto can be performed in a variety of ways. Particularly preferred in

accordance with the present invention is the use of solvent-free adhesives, in particular those based on polyurethane.

5 If a composite sheet without an aluminium foil is provided, it may be required in some cases to protect the packaged goods from solar radiation, especially action of light. For instance, it is possible to metallize the outer layer by methods known per se in the prior art.

10 The composite sheets according to the invention are particularly useful for the preparation of flat sheets, bags or case insets. As has been mentioned earlier, the use of additional substrate materials containing corrosion inhibitors is not necessary.

The composite sheets according to the invention are particularly preferred for packaging consumer goods based on ferrous metals and/or non-ferrous metals which are susceptible to corrosion.

15 The following examples 1 to 4 represent embodiments of composite sheets according to the invention each containing an inhibitor for ferrous metals (dicyclohexylamine nitrite), as well as benzotriazole as an illustrative inhibitor for non-ferrous metals. It may generally be noted that the amount of the  
20 corrosion inhibiting additive for ferrous metals and/or non-ferrous metals may be varied within the range of from 2 to 10% by weight, in particular of from 3 to 6% by weight.

25 Too low an amount of corrosion inhibitor will not yield a sufficient effect whereas too high an amount is uneconomic, on one hand, and in addition adversely affects the qualities of the composite sheet.

The set-up of the composite sheets according to the invention, by DIN (German Industrial Standard) 55531, may be represented as follows:

Example 1:

	outer layer	PET 12 $\mu\text{m}$
	adhesive	LF PUR resin 1.8-2.0 $\text{g/m}^2$
	Al foil	15 $\mu\text{m}$ , 99% pure
5	adhesive	LF PUR resin 1.8-2.0 $\text{g/m}^2$
	sealable coating	LDPE 80 $\mu\text{m}$ , containing 3% by weight of dicyclohexylamine nitrite

Example 2:

	outer layer	PET woven fabric 40/40
10	adhesive	LF PUR resin 1.8-2.0 $\text{g/m}^2$
	PET	12 $\mu\text{m}$
	adhesive	LF PUR resin 1.8-2.0 $\text{g/m}^2$
	Al foil	15 $\mu\text{m}$
	adhesive	LF PUR resin 1.8-2.0 $\text{g/m}^2$
15	sealable coating	LDPE 80 $\mu\text{m}$ , containing 3% by weight of dicyclohexylamine nitrite and 3% by weight of benzotriazole

Example 3:

	outer layer	cotton woven fabric 15/15
20	adhesive	LF PUR resin 1.8-2.0 $\text{g/m}^2$
	PET	12 $\mu\text{m}$
	adhesive	LF PUR resin 1.8-2.0 $\text{g/m}^2$
	Al foil	15 $\mu\text{m}$
	adhesive	LF PUR resin 1.8-2.0 $\text{g/m}^2$
25	sealable coating	LDPE 80 $\mu\text{m}$ , containing 3% by weight of benzotriazole

Example 4:

	outer layer	paper 100 g/m <sup>2</sup>
	LDPE	20 g/m <sup>2</sup>
	Al foil	15 μm
5	adhesive	LF PUR resin 1.8-2.0 g/m <sup>2</sup>
	sealable coating	LDPE 80 μm, containing 3% by weight of dicyclohexylamine nitrite



C l a i m s :

1. A composite sheet for the use in mailing packings, in particular as a protection from water vapour permeation, comprising

5            -     an outer layer made of poly(alkylene terephthalate),  
polyalkylene or polyamide sheets, woven or non-woven  
fabrics, natural fibre or synthetic woven or non-woven  
fabrics, or paper;

- a low-pore aluminium foil; and

10            -     a heat sealable coating bonded thereto which faces the  
                 packaged goods;

characterized in that said heat sealable coating contains corrosion inhibiting additives for ferrous metals and/or non-ferrous metals.

- 15      2. A composite sheet for the use in mailing packings, in particular as a protection from water vapour permeation, comprising

20           -     an outer layer made of poly(alkylene terephthalate),  
polyalkylene or polyamide sheets, woven or non-woven  
fabrics, natural fibre or synthetic woven or non-woven  
fabrics, or paper; and

- a heat sealable coating bonded thereto which faces the packaged goods;

25 characterized in that said heat sealable coating contains corrosion inhibiting additives for ferrous metals and/or non-ferrous metals.

3. Composite sheets according to claims 1 or 2, characterized in that said alkylene group is selected from ethylene and/or butylene.
- 5 4. Composite sheets according to claim 1, characterized in that said aluminium foil has a thickness of at least 7  $\mu\text{m}$ , in particular, at least 12  $\mu\text{m}$  or more.
5. Composite sheets according to one or more of claims 1 to 4, characterized in that said heat sealable coating has a thickness of at least 50  $\mu\text{m}$ , in particular, 75  $\mu\text{m}$  or more.
- 10 6. Composite sheets according to one or more of claims 1 to 5, characterized in that said heat sealable coating consists of polyethylene.
- 15 7. Composite sheets according to one or more of claims 1 to 6, characterized in that said corrosion inhibiting additive is selected from amines, aminoimidazolines, aminophenols, nitrophenols, aminotriazoles, aldehydes, benzotriazole, dibenzylsulfoxide, dithiophosphonic acids, guanidine derivatives, ureas, phosphonium salts, sulfonium salts, sulfonic acids, thioethers, thioureas, and thiocarbamoyl  
20 disulfides.
8. Composite sheets according to one or more of claims 1 to 7, characterized in that the layers are bonded together by means of solvent-free adhesives, in particular those based on polyurethane.
- 25 9. Composite sheets according to one or more of claims 2 to 8, characterized in that said outer layer is metallized.
10. A composite sheet for use in mailing packings, substantially in accordance with any Example hereinbefore described.

10

**Patents Act 1977**  
**Examiner's report to the Comptroller under Section 17**  
**(The Search report)**

Application number  
 GB 9522985.2

**Relevant Technical Fields**

- (i) UK Cl (Ed.O)      B5N, B2E  
 (ii) Int Cl (Ed.6)      B32B 27/18

Search Examiner  
 R J MIRAMS

Date of completion of Search  
 25 JANUARY 1996

**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-  
 1 TO 10

(ii) ONLINE: WPI, CLAIMS

**Categories of documents**

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|--|---|
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|--|---|

Category	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2179002 A (NIPPON SEIKAHU) whole document	at least 1, 2, 4, 6, 7
X	GB 1370204 A (DAUBERT) eg Claim 2	at least 2, 7
X	US 5139700 A (MIKSIC) eg Claim 12	at least 1, 2, 6, 7, 9
X	JP 3087252 A (SANE) see Abstract	at least 2
X	JP 51039784 A (AICELLO) see Abstract	at least 2
X	JP 49014342 B (NIPPON KAKOH) see Abstract	at least 2

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